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Development of photoacoustic water vapor and total water measuring instrument with a long term objective of becoming part of the IAGOS project

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Airborne hygrometry is one of the key topics in atmospheric and climate research that is why airborne hygrometers are almost always included in aircraft based measurement campaigns (see e.g. MOZAIC and CARIBIC). However for its successful application an airborne hygrometer has to be able to measure humidity in a wide range (1 60000 ppmV) at various total pressures with high accuracy and short response time. In addition, an instrument capable of measuring water vapor and condensed water selectively has considerable added value as the water content of clouds seems to be a very uncertain parameter in climate models.

At the University of Szeged, a dual channel, photoacoustic spectroscopy based hygrometer system had been developed, that measures water vapor concentration and total water content simultaneously from the ground level up to cruising altitude [1, 2]. An early version of this system is the core hygrometer of the CARIBIC project. In the past few years efforts were made to improve further the performance and long term reliability of the system [3] while also reducing its size and weight. Most important of the recent achievements is a new data acquisition and control system with more precise control performance [4]. Many of these results have been proved by various laboratory (AquaVIT2a-b) and in-flight (DANCHAR-IFCC, AIRTOSS I-II) measurement campaigns.
Based on these results the system received invitation into the IAGOS ESFRI project to become one of its core instruments.

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